

REMARKS

Claims 1-15 and 17-20 are pending. Claim 16 is canceled, and claims 1-15 and 17-20 are amended in this response. Reconsideration of the application is respectfully requested in view of the following remarks.

I. REJECTION OF CLAIMS 2-4, 6-14, 16-18 AND 20 UNDER 35 U.S.C. § 112 SECOND PARAGRAPH

Claims 2-4, 6-14, 16-18 and 20 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite. Claims 2-4, 6-14, 16-18 and 20 have been amended to address the above highlighted issue. Accordingly, withdrawal of the rejection is respectfully requested.

II. REJECTION OF CLAIMS 1-3, 5-6, 9, 12, 15 AND 20 UNDER THE DOCTRINE OF OBVIOUSNESS TYPE DOUBLE PATENTING

Claims 1-3, 5-6, 9, 12, 15 and 20 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting in view of claims 1, 7, 30-31, 51 and 52 of co-pending Application Serial No. 09/975,639 (Smith). Withdrawal of the rejection is respectfully requested for at least the following reasons.

- i. The claims of the present invention are non-obvious over the claims of Smith because Smith does not recite a non-plasma anneal as recited in the present invention.***

Claim 1 of the present invention is directed to a method of cleaning a wafer, comprising cleaning a polymer residue using a wet clean solvent, and ***performing a non-plasma anneal to remove a component of the solvent*** prior to a metal deposition. As highlighted in applicants' specification, for example in paragraphs [0016] and [0017], prior to the present invention the wet clean solvent would effectively remove the polymer residue, but would itself diffuse into the porous low-k dielectric material,

only to subsequently desorb during a subsequent deposition. According to the invention, ***the non-plasma anneal successfully removes the component of the solvent without negatively impacting the critical dimension (CD) of the etched dielectric, which may otherwise occur when exposed to a plasma.***

It is respectfully submitted that claims 1, 7, 30-31 and 51-52 do not teach this feature. In particular, in claims 1, 7 and 51-52 of Smith, a polymeric residue is removed using a wet etch chemistry, followed by a ***plasma anneal***, which, as highlighted above would result in potential CD loss and/or via degradation. Claims 30-31 of the co-pending application differ from the present invention in that such claims recite a removal of polymeric residue by subjecting the wafer to a wet etch, however, no subsequent anneal step (plasma or non-plasma) is provided. Therefore the cited claims of the co-pending application do not render the pending claims of the present invention obvious. Accordingly, withdrawal of the rejection is respectfully requested.

III. REJECTION OF CLAIMS 1, 9-13 AND 15 UNDER 35 U.S.C. § 102(e)

Claims 1, 9-13 and 15 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Serial No. 2003/0194877 (Yau et al.). Withdrawal of the rejection is respectfully requested for at least the following reasons.

Claim 1 is directed to a method of cleaning a wafer. The method comprises patterning a via and/or a trench in a porous, low-k dielectric layer, and cleaning polymer residue from surfaces of the patterned dielectric. The method further comprises performing a non-plasma anneal ***on the patterned dielectric layer*** to remove a component of the solvent. Yau et al. do not teach the invention of claim 1.

Yau et al. teach the patterning of a metal layer. After patterning thereof, a clean and anneal is performed ***on the exposed metal*** prior to a capping operation to cover the metal prior to exposure to an ambient atmosphere. Yau et al. do not teach or suggest cleaning of polymer from a patterned dielectric with a solvent and then performing a non-plasma anneal on the dielectric to remove a component of the solvent from the dielectric as claimed. Therefore Yau et al. do not anticipate the invention of

independent claim 1 and its associated depending claims. Accordingly, withdrawal of the rejection is respectfully requested.

IV. REJECTION OF CLAIMS 1-3, 5-8 AND 16-18 UNDER 35 U.S.C. § 102(b)

Claims 1-3, 5-8 and 16-18 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application Serial No. 2002/0058397 (Smith et al.).

Withdrawal of the rejection is respectfully requested for at least the following reasons.

As highlighted above, claim 1 recites performing a non-plasma anneal on the patterned dielectric layer to remove a component of the solvent. Smith et al. do not teach this feature. Rather, Smith et al. disclose a plasma based anneal. Therefore Smith et al. do not anticipate independent claim 1 and its associated depending claims. Accordingly, withdrawal of the rejection is respectfully requested.

V. REJECTION OF CLAIMS 2, 5-6, 14, 16-18 AND 20 UNDER 35 U.S.C. § 103(a)

Claims 2, 5-6, 14, 16-18 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yau et al. in view of U.S. Patent No. 6,713,402 (Smith et al.).

Withdrawal of the rejection is respectfully requested for at least the following reasons.

i. The combination of Yau et al. and Smith et al. is improper because there is no motivation to combine the references.

It is conceded that references may be combined properly when one of ordinary skill in the art finds some motivation or suggestion to do so. Such motivation may be found in the references themselves, in the general knowledge of those skilled in the art, or in the nature of the problem to be solved. MPEP § 2143.01 (*citing In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998)). However, such motivation cannot be set forth in a conclusory fashion, rather ***the showing for such motivation must be clear and particular.*** *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999). It is respectfully submitted that under this proper analysis of the cited references, the requisite

motivation does not exist and thus the combination of Yau et al. and Smith et al. is improper.

Yau et al. teach the formation and patterning of metal layers. As set forth in Yau et al. (see, e.g., paragraph [0002], after etching a metal layer to pattern one or more metal structures, remaining etch residues may be reactive and combine with gases to form corrosive agents on the wafer, thereby degrading the metal structures. As set forth in Yau et al., **a wet clean is performed** to remove the etch residues, followed by a capping procedure. (See, e.g., paragraph [0026]).

Smith et al. do not teach a post metal etch clean, but instead disclose a post etch stop layer etch clean performed in conjunction with formation of damascene type structures in dielectrics. As set forth in the background thereof, **wet cleans were employed in the past, but were found to be ineffective in conjunction with newer low-k type dielectric materials**. (See, e.g., Col. 2, lines 20-38). Consequently, **Smith et al. replace a wet clean with a plasma clean to remove residue** after etching the etch stop layer. Therefore one of ordinary skill in the art upon reviewing the two cited references would not have been motivated to combine them together because one of the references teach a wet clean, while the other reference identifies a wet clean as deficient, discards such procedure, and replaces the wet clean with a plasma clean. Therefore, in one respect, Smith et al. teach away from the teaching in Yau et al. or otherwise discourage use of a wet clean. Since no motivation exists for a combination of the cited art, the combination is inappropriate. Accordingly, withdrawal of the rejection is respectfully requested.

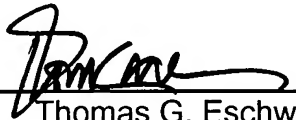
VI. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 20-0668, TI-33260.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: October 13, 2005


Christine Gillroy